A Spray-Drying Method for Encapsulating Biological Molecules in Cross-linked Alginate Microcapsules

Tech ID: 20956 / UC Case 2010-695-0

ABSTRACT

Researchers at the University of California, Davis have developed a scalable, spray-drying method for alginate molecule encapsulation.

FULL DESCRIPTION

Encapsulation of molecules in dry, cross-linked alginate microcapsules (CLAMs) has numerous applications in the pharmaceutical, agricultural/nutritional and chemical sectors. Among encapsulation matrices, alginate is preferred due to its low cost, biodegradability, and biocompatibility. While alginate microcapsules offer advantages related to core material protection and release, current methods for encapsulating biological molecules and cells in cross-linked alginates are both time-consuming and energy-intensive. Frequently, the size of the produced particles is also limited to those having large diameters. Thus, an improved method for CLAM production would enable wider use of alginate microcapsules across multiple industries.

Researchers at the University of California, Davis have developed a process for producing cross-linked alginate microcapsules using a time-efficient and economical spray-drying method. This method streamlines CLAM production into a single unit operation by accomplishing particle formation, cross-linking, and drying all during the spray-drying process. This process is commercially scalable and involves considerably fewer unit operations than existing methods for CLAM preparation.

CLAMS have proven effective in several applications of commercial importance – including prolonging the limited viability of bacteria and enabling the controlled release of nutrients in the intestine. By using an easily scalable, spray-drying method to encapsulate molecules, the various benefits of alginate can be leveraged across a much wider range of industries – including pharmaceuticals, agriculture, chemicals and food and nutritional applications.

This same process can be applied to encapsulation using soy protein.

APPLICATIONS

- Suitable for use in multiple industries
- Can be used to encapsulate biological molecules, cells, probiotics, nutraceuticals, and other biochemicals

FEATURES/BENEFITS

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OTHER INFORMATION

KEYWORDS

cells (including stem cells), probiotics, nutraceuticals, calcium-mediated cross-linking of polymers, spray-drying, cross-linking, alginates, soy proteins, encapsulation, biochemical, alginate microcapsule

CATEGORIZED AS

- **Agriculture & Animal Science**
  - Processing and Packaging

- Increased yields of cross-linked alginate (or soy protein) particles of controlled particle size and narrow size distribution
- Encapsulation using renewable polymers
- One-step process that includes particle formation, particle cross-linking and particle drying
- Controlled release of encapsulated ingredients and prolonged viability of active agents

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,610,492	04/07/2020	2010-695
United States Of America	Issued Patent	9,700,519	07/11/2017	2010-695

- **Biotechnology**
  - Food
  - Health
  - Industrial/ Energy
- **Engineering**
  - Engineering
- **Materials & Chemicals**
  - Agricultural
  - Polymers

RELATED CASES

2010-695-0

RELATED MATERIALS

- Strobel, S; Knowles, L; Nitin, N; Scher, H; Jeoh, T (2019) Comparative Technoeconomic Process Analysis of Industrial-Scale Microencapsulation of Bioactives in Cross-Linked Alginate. Journal of Food Engineering 266:109695 - 08/19/2019
- Strobel S, Scher H, Nitin N (2019) Control of physicochemical and cargo release properties of cross-linked alginate microcapsules formed by spray-drying. Journal of Drug Delivery Science & Technology 49:440-447 - 02/01/2019
- Strobel S, Allen K, Roberts C, Jimenez D, Scher H, Jeoh T (2018) Industrially-Scalable Microencapsulation of Plant Beneficial Bacteria in Dry Cross-Linked Alginate Matrix Industrial Biotechnology 14:3 - 06/01/2018
- Strobel S, Scher H, Nitin N, Jeoh T (2016) In situ cross-linking of alginate during spray-drying to microencapsulate lipids in powder. Food Hydrocolloids 58:141-149 - 07/01/2016

RELATED TECHNOLOGIES

- One Step Process of Forming Complex Coacervation During Spray Drying

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Spray Dry Method for Calcium Cross-linked Alginate Encapsulation of Biological and Chemical Moieties via the Use of Chelating Agents
- One Step Process of Forming Complex Coacervation During Spray Drying

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